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NATURAL AND ARTIFICIAL INCUBATION AND BROODING OF CHICKENS

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NATURAL AND ARTIFICIAL INCUBATION

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SELECTING EGGS FOR HATCHING

In selecting eggs for hatching only well-formed eggs should be used. Do not select eggs that have ridges around them, that are too small, that have thin shell, that have small end enlarged, that are short and round, that are abnormally long, or those on which the lime is not deposited regularly, as such eggs do not hatch well. Hatching eggs should weigh at least two ounces.

Eggs for hatching should be kept in a cool place and covered from the dirt and dust. Set them as soon as possible, and never set eggs that are over twenty-one days old.

Records show that a fair hatch to expect from one sitting of fifteen eggs when they are set on the premises where laid, is ten chicks, and if handled or shipped, eight chicks. If set in an incubator, the hatch is still less. One should obtain from 50 to 60 per cent chicks from eggs put in the machine, but much depends upon the operator, a good operator getting a much better hatch than one who handles the machine badly. All the low hatches cannot be blamed on the hen.

Hauling eggs over rough roads without protection from the hard jarring will injure them and cause a poor hatch; likewise, careless handling by express or postal employees.

In shipping eggs for hatching, parcel post containers should be used. Wrap each egg with soft paper before placing it in its cell, tie well with strong cord, and label "eggs for hatching" on all sides of the box, preferably with red ink.

TIME REQUIRED FOR HATCHING

The number of days necessary for hatching eggs of various kinds is as follows: Chickens, 21 days; geese, 30 days; turkeys, 28 days; ducks, 28 days; guineas, 28 days; pigeons, 17 days.

SOME REASONS WHY CHICKS DIE IN THE SHELL

Eggs from birds of low vitality, such as old and impotent hens, and those too fat by lack of exercise, do not produce good hatching eggs. Immature birds should not be selected for breeding, and too many

females should not be mated with one male. Nutritious feed should be supplied and the birds should be kept in sanitary, properly ventilated quarters. The birds should be kept free from vermin, such as lice and mites, which sap their vitality. Eggs must not be kept too long before incubation or at too high a temperature.

Proper methods of incubation must be used. In the heavy breeds, as the Reds and Rocks, ten or twelve females may be mated to one male, and in the lighter breeds, as White Leghorns, fifteen to twenty. Less numbers should be kept with older males. The hens' feed must be properly balanced. The breeders must be in good, vigorous condition in order that the progeny may be strong and vigorous. Breeding stock should not be expected to lay too heavily during the preceding winter. They should have exercise, must never become frightened, and sanitary surroundings should be provided. Tests show that when the hen is fed scantily and no green feed is given, the fertility of the eggs is low.

HOW TO SET A HEN

For the farm, the combination sitting and brooding coop will be found very useful. This coop is two feet square, two feet high in front and eighteen inches behind, with shed roof covered with prepared roofing material. The front is slatted and a frame covered with one-half inch mesh sand screen is placed in front of the coop at night to keep out rats. The coop should have a board floor and a nest five inches deep should be built in.

A box for the sitting hen should be sixteen inches square with a board five inches wide at the lower portion of the front to give support to the nest. Make the nest of excelsior or soft straw, such as oat or wheat straw. Work the straw down carefully so as to make it well rounded out, with no low corners for the eggs to roll into and become chilled. Leave no sharp straws sticking up to prick the hen.

The box should be placed in a darkened room away from the other hens and from rats if the combination sitting and brooding coop is not used. Keep feed and water before the sitting hen at all times. If several are set in one room she may be let off once a day. If an egg becomes broken, secure a pan of warm water and dip the eggs that are smeared, cleaning them with as little rubbing as possible. If eggs become smeared and are not properly washed, the pores will become closed and the eggs will not hatch well. Soiled straw should also be removed and replaced with clean straw.

The best type of hen to sit is one of medium weight, such as the Rocks, Reds, Wyandottes or Orpingtons. The light breeds are not so large or well feathered and make poor sitters. For early hatching, a hen with much body fluff is desired.

CANDLING THE EGGS

Candle eggs on the seventh day and remove all infertile eggs. Place the fertile eggs under five hens if six hens are sitting, and give the sixth hen another sitting. A home-made candler may be made by using a small lamp and a shoe box. Cut a hole in one end for air and the lamp flue, and a hole on one side for candling. Hold the egg up to the side hole and if it is fertile the chick can be seen. If the egg is infertile it will appear clear. The candling should be done preferably at night.

CARE OF THE CHICKS

If the sitting hen is quiet during hatching, leave the chicks under her, as the heat from the mother's body is of proper temperature. Where several hens are set at the same time, the chicks may be removed as fast as hatched and kept in a woolen-lined box covered with paper till the hatch is over. Then at night give each hen fifteen to twenty, depending on the number she can hover well. One hen may in this way be returned to the flock of layers.

To protect the chicks from hawks and rats, make a wire netting run 4 feet by 12 feet, and 18 inches high, and allow the chicks to run in this enclosure during the day. At night a frame covered with one-half inch mesh sand screen placed tightly against the front of the coop will keep out the rats.

The hen usually weans her young when they are from six to eight weeks old. They should then be placed in a range house and not placed with the adult birds until fall.

HATCHING EGGS WITH THE INCUBATOR

Five eggs should be set for every pullet wanted. If it is the desire to have 500 pullets, 2,500 eggs must be set. Fifty per cent hatch will give 1,250 chicks and twenty per cent deaths will leave 1,000 chicks, of which about fifty per cent will be cockerels. These may be sold as broilers when ten weeks old, thus leaving five hundred pullets.

Hatching may be done by a small oil, gas, or electric incubator, or by a mammoth coal, gas, or electric incubator. The cost of operating

a 100-egg incubator twenty-one days, using kerosene at 14 cents per gallon, will be about 30 cents. It costs ten to fifteen cents to feed a sitting hen.

EXPLANATION OF THE INCUBATOR

The small oil-burning incubator consists of three essential parts, namely: An insulated and ventilated box—the body—a heater, and a regulating device. The body of the machine is supported by legs. The heating device is attached to the side of the body, except in those operated by electricity or by a stove. The body is provided with three chambers, namely: An upper, middle, and a lower chamber.

The upper chamber is the heating chamber, and is separated from the egg chamber by a cloth diaphragm in those heated by hot air. The eggs occupy the middle chamber. The lower chamber, when present, is provided with canvas-covered trays and is called the nursery chamber and the trays, the nursery trays. Where a movable piece is provided to the front part of the egg tray, this must be removed on the eighteenth day so that as the chicks hatch the light causes them to come forward and fall down into the nursery tray. If the machine has a cloth diaphragm it must be brushed after each hatch to prevent clogging the pores with dust. In single-tray incubators the tray should be turned end for end each day. In two-tray incubators the trays should be turned end for end and trays exchanged each day. In hot water systems the chamber is occupied by pipes. These pipes are not separated from the egg chamber.

STARTING AND REGULATING THE INCUBATOR

The regulating device is so arranged that a fairly even temperature can be maintained, but the incubator should be placed in a room in which the temperature does not vary more than twenty degrees in twenty-four hours. A dry cellar with floor air drainage is preferred or a "spare" room on the north side of the house. Drafts must not be allowed on the incubator. The incubator has a ventilator at the bottom for the escape of carbon dioxide and this must be kept open at all times.

For oil-burning incubators use only a good grade of oil. Clean properly, trim wick, and fill with oil once a day. It is best to scrape off the charred portion of the wick with a dull knife. The burner must be thoroughly cleaned by boiling after each hatch. Turn eggs before handling lamp. Oil on one's hands will ruin the hatch if eggs are handled afterward, as the oil closes the pores in the shell.

In starting an incubator, first level it with a spirit level. Loosen the thumb screw on the top of the incubator till the tin disc closes the top of the heater flue. Then start the lamp. Have all ventilators of the incubator open and do not put the eggs in the machine until the temperature is 103 degrees F. at the top level of the eggs for at least twenty-four hours.

Eggs in incubation require plenty of air, as a lack of proper exchange of air in the machine means a low hatch. The temperature must be kept at 103 degrees F., as an uneven temperature means a low hatch and weak chicks. The force draft cabinet machines run a lower temperature and the directions that come with the machine should be followed. Eggs from the third to the eighteenth day must be turned at least once a day and six times a day will give a better hatch, and fewer cripples. A hen turns her eggs nine times a day. Eggs in incubation must lie on the sides and not on the ends.

BROODING CHICKS ARTIFICIALLY

The brooder should be kept at a temperature of 95 to 98 degrees F. at all times. Chilling of chicks develops a catarrhal condition of the bowels which causes diarrhea. Be sure your chicks do not become chilled in the after part of the night. This is a common cause of heavy death loss in brooder chicks. The air of the brooder house should be fresh and pure at all times. There should be no draft on the birds.

On warm days the chicks should be allowed to run out, but should be returned before the evening air becomes cool enough to chill them. Where there is a large number of chicks, care must be taken not to allow them to pile and thus be killed. Fresh, clean water must be kept before the chicks at all times, remembering that spoiled feed and foul water containers make sick chicks, diarrhea, and death. The feeding must be regular, and the proper kinds of feed supplied at all times. Chicks must have exercise, so the grain feed is thrown in fine litter in their run. The litter under the hover must be changed each day, and all the litter of the run must be changed once a week. In small lots of 50 to 100, the chicks may be brooded in oil-burning hovers or electric brooders, but in lots of 350 to 500, the coal or oil-burning deflector hover is best. Chicks should have at least 35 square feet per 100. A house 10x12 or 12x12 will accommodate from 350 to 400 baby chicks.

SUFFICIENT FOOD AT HATCHING TO LAST THREE OR FOUR DAYS

The sitting hen should be fed a grain mixture similar to that of the laying hen. In experiments conducted at this college, we have found that 47 per cent of the yolk of the egg remains in the body of the chick at hatching, and that this yolk lasts the chick for three or four days after hatching, and in some cases, five-day old chicks still have had some of the yolk in the abdominal cavity.

If hatched in an incubator they can be taken from the nursery tray on the third day after the first chick pips out of the shell. If the incubator has no nursery trays, the chicks must be taken from the incubator as fast as they are dry and placed in the brooder. This is kept at a constant temperature of 95 to 98 degrees F. If the chicks are hatched by a hen, dust her at the time of sitting with an efficient lice powder or snuff and again when she is taken from the nest. Examine the head and neck of the hen and if nits or lice are found under the throat or among the neck feathers a small amount of lard, in which has been rubbed a small quantity of sulphur, should be rubbed among the feathers to kill the parasites. No oily substance should be put on the feathers of the body of the hen, as any grease whatever getting on the eggs will cause them not to hatch. The hen must be taken from the nest as soon as the last chick is dry. The chicks may be brooded in the same coop they are hatched in by removing the nesting frame and litter.

The chicks should not be fed till they are 72 hours old. The feed for the chicks the first day should consist of buttermilk or sour skim milk. The second day the chicks are given milk to drink and two very light feeds of mash, consisting of cooked infertile eggs, using the eggs left over after candling. These eggs are rubbed in dried bread crumbs, rolled oats, or the regular chick mash.

On the third day the chicks are placed on full feed. This will make the older chicks six days old. It has been observed that this method, which has been used at three of our poultry experimental farms for ten years, has given most excellent results, because it gradually brings the digestive organs of the newly-hatched chick into full activity and gives the body a chance to use the stored yolk food nature has provided. As a result the chicks are stronger. In case milk is not to be had and the animal feed consists of the fish meal or of meat meal in the mash, give the first day two light feeds, the second day three light feeds, and the third day full feed.

MASH MIXTURE FOR CHICKS

No. 1

Corn meal	26 pounds
Wheat middlings	26 pounds
Fine ground oats	26 pounds
Meat meal or fish meal	16 pounds
Fine table salt	½ pound
Bone meal	4 pounds

No. 2

Soybean meal (fat extracted)	34 pounds
Corn meal	66 pounds

Mash No. 1 can be given in trough in a dry state and kept before the chicks at all times. Mash No. 2 must be given with milk to drink, giving them all they will consume, otherwise, it is essential to replace at least 15 per cent of the soybean meal with fish meal or meat meal to supply the animal feed.

No. 3

Peanut meal (fat extracted)	34 pounds
Corn meal	66 pounds

No. 3 mash is to be fed exactly as mash No. 2, keeping it before the chicks at all times in a dry mash hopper, but giving all the sour skim milk or buttermilk the chicks will drink.

No. 4

Corn meal	28 pounds
Wheat middlings	28 pounds
Ground oats (fine)	28 pounds
Meat or fish meal	16 pounds

This is to be given with or without milk. Any one of these four formulae will give good results if given in the proper manner.

On the seventh day begin the grain feed, giving two feeds a day. If the chicks are reared under a brooder, the grain must be given in finely-chopped straw so as to furnish exercise, as this is essential for the health and proper growth of the chicks.

GRAIN MIXTURE FOR CHICKS

Cracked corn	30 pounds
Cracked wheat	20 pounds
Hulled oats	10 pounds

Pure clean water must be kept before the chicks at all times. Succulent or tender green feed, as rape, sprouted oats, or clover, should be given each day and if these are not available then one pint cod liver oil to each 100 pounds mash should be given. The chicks should be

in direct sunshine as much as possible. Sun passing through glass does not contain the life-giving powers direct sunshine does. Grit is necessary and the ration containing the mineral supplements as bone meal and table salt are to be preferred. Do not use more than ½ per cent table salt. Pure limestone grit is to be preferred.

Chicks should go on range as soon as they are weaned or do not longer need artificial heat. The pullets should be separated from the cockerels, allowing not more than 100 to 200 chicks to the acre. Proper living conditions are required for chicks both in the brooder and on range that they may make proper development. Usually chicks may go on range at 6 to 8 weeks of age.

As soon as the cockerels reach a weight of 1½ pounds it is a good plan to fatten them for 14 days and market them. Those cockerels possibly needed for breeding purposes should be given a range by themselves. Cotton fields, tobacco fields, and fields on which small grain crops have been cut are suitable for these ranges.

REARING YOUNG STOCK

Not only is it necessary that the brooder chicks be strong and vigorous, from mature stock, free from disease, and properly brooded under proper environmental conditions for the first few weeks, but unless they receive the proper care and attention during the growing season, they will not develop into large, healthy, well-matured pullets and the loss from disease will be great. High egg production is necessary for the maximum profit from poultry and unless the birds are put into the laying house in the fall in the pink of condition, one cannot expect the maximum returns from them.

Seven important factors affecting the development of pullets after the brooder period are as follows: Housing, range, shade, green feed, clean fresh water, feed and feeding practices, and the care and management.

A shed roof type house with large open front covered in front with chicken netting is advisable for range houses. Such a house may be 10 by 12 feet and built on runners so as to be portable. This will give plenty of fresh air and can be moved from place to place. Roosts should be placed in the house. These may be made of 2″ x 4″ timbers dressed on all four sides. They should be about 12 to 15 inches above the floor. The roof may be constructed of prepared roofing and the walls of boxing boards slatted. A ventilator 18″ x 4′ should be provided on the back and two sides, or the house may be a mere frame covered with two-inch mesh chicken netting on all four sides for hot weather houses.

These range houses may be located along the edge of cotton, tobacco, or corn fields or where small grains have been removed. Not more than 50 birds should be kept in a single house and the houses should be separated by considerable space. The crowding of too many birds into one house or on a given space of ground does not produce the best living conditions. Range is necessary for growing chickens and the above conditions bring the birds closest to natural environment.

Green feed is necessary for the young growing birds. It should be tender. If green feed cannot be secured from the range additional supply must be given either in the form of crops raised especially for this purpose, or waste from the garden or table.

If the young stock are ranged in an orchard or along the edge of a corn, cotton, or tobacco field, additional shade will not be necessary. If natural shade is lacking, some artificial shade should be supplied. Wooden frames covered with brush or burlap will take care of the birds' needs.

Water at all times is essential to chickens. It should be fresh, clean, and cool. Water aids in the growth and digestion and helps to regulate the body temperature. Locate the drinking fountains in the shade and plan to keep them filled continually. A thorough cleansing of the drinking fountains each day will help to prevent the spread of poultry diseases.

Chicks under the brooder, after the first week, are put on fine-cracked grain mixture in addition to the mash mixture. After chicks are a month old they can be put on intermediate scratch feed. The growing mash should always be kept before the birds. The North Carolina growing mash is as follows:

Table salt	1 pound
Bone meal	4 pounds
Fish meal or meat meal	17 pounds
Wheat middlings	20 pounds
Pulverized oats	20 pounds
Corn meal	38 pounds
Total	100 pounds

The grain mixture is the same as for brooder chicks except that as the birds grow larger the grain need not be cracked so fine.

Make an occasional examination of the young stock to be sure it is not lousy. Also occasionally examine the perch poles to see that there are no mites. If mites are present they will be seen on the under side of the perch poles. In case mites are present, clean the house and burn the litter. Spray the house with a four percent solution of zenoleum and paint the perch poles with pure zenoleum or creosote.

In case of lice, dust with nicotine lice powder or dip in a one percent solution of zenoleum.

Males make more rapid growth and develop heavier in the same length of time than pullets. Males of the larger breeds, as Rhode Island Reds, should weigh from 1¼ to 1½ pounds at eight weeks of age. The pullets should weigh considerably less. The following table is an average of the amount of feed consumed by ten flocks of Single Comb Rhode Island Red chicks each week, from baby chicks to 24 weeks of age. The figures are computed for 100 chicks. These flocks were reared at the Coastal Plains Experimental Poultry Plant under the directions of this department and were handled just as they would be on a farm.

At the end of the ninth week some of the cockerels were removed and since cockerels eat more feed than pullets, there is a drop in the amount of feed consumed for the tenth week. The same holds true of the 12th, 17th and 22nd weeks. It requires an average of 2,557.67 pounds of feed, consisting of mash and grain to rear 100 birds to the end of the 24th week, of which 1,310.0 pounds is mash and 1,252.23 pounds is grain.

AMOUNT FEED FOR ONE HUNDRED RHODE ISLAND RED CHICKS

Average of Ten Tests

Week	Pounds Mash	Pounds Grain	Total
1st	9.7	2.58	12.32
2nd	18.3	9.30	27.16
3rd	23.0	12.49	35.52
4th	27.0	16.27	43.30
5th	34.0	24.27	58.36
6th	35.0	30.97	66.05
7th	46.1	36.39	82.52
8th	53.3	43.17	95.58
9th	64.6	51.39	116.06
10th	55.8	53.00	108.90
11th	61.9	58.80	120.70
12th	60.0	55.90	115.80
13th	56.6	66.70	123.40
14th	63.0	65.10	128.10
15th	62.8	65.80	128.70
16th	71.7	68.90	140.70
17th	72.0	64.70	133.90
18th	77.3	76.20	153.60
19th	77.6	79.70	157.40
20th	69.8	68.70	137.10
21st	66.9	71.20	138.10
22nd	65.6	79.20	144.90
23rd	66.5	72.50	139.00
24th	71.5	79.00	150.50
Totals	1,310.0	1,252.23	2,557.67